

Addressing Nigerian Food Insecurity and Agricultural Production in a Changing Climate Context¹

Introduction

Nigeria's food security situation is characterised by the threat of hunger and poverty, which confronts the 69 percent of the population that lives on less than Naira 100 (US\$ 0.7) per day.² Smallholder farmers account for 80 percent of all farm holdings, but crop yields are far below potentials. This is due to inadequate access to and low uptake of high quality seeds and inefficient production systems, leading to regular shortfalls in production.³ Although the growth rate averaged 7 percent in the 2006–2008 period, it is still below the 10 percent estimated as necessary for sustainable food security and poverty reduction. The country continues to import a substantial part of its food, due to underexploited agricultural potential.⁴

Currently, the population of Nigeria involved in farming is 60–70 percent. Agriculture contributed 42 percent to GDP in 2009.⁵ Despite a growing urban population, in 2000 at least 56 percent of the population resided in rural areas,⁶ where the main economic activity is agriculture. This puts the agricultural sector ahead of other sectors in terms of its importance for the food security, livelihood and well-being of most Nigerians.

Nigeria's diverse agro-ecological zones and other characteristics show that it has a high agricultural potential. Nigeria has about 79 million hectares of arable land, of which 32 million hectares is cultivated. Its surface water totals around 267 billion cubic meters, while underground water accounts for about 57.9 billion cubic meters.⁷ Although the figures given for the potential irrigable area vary, actual irrigated area is only a small fraction of that potential. As over 90 percent of agricultural production is rain-fed, rainfall patterns and amounts further influence agricultural production. Changes in climate thus have significant consequences for food security and crop production.

Impact of Climate Change on Food Security and Agricultural Production in Nigeria

The climate of Nigeria ranges from a very wet coastal humid zone, with annual rainfall around 4,000mm to the semi-arid Sahel region in the far north, with annual rainfall below 600mm.⁸ The inter-annual rainfall variability, particularly in the northern parts, is large. This often results in floods and droughts, with devastating effects on food production and associated sufferings. Odjugo reported an increasing trend in temperature in Nigeria since 1901 – gradual till the late 1960s, but sharper since the 1970s – which has continued to date.⁹ A major part of the middle belt sub-humid to semi-arid areas experienced rainfall deficits from 1991 to 2006 compared to the World Meteorological Organisation reference period of 1961–1990, while a few areas to the northwest experienced surplus rainfall over the same period.¹⁰

While climate change is contributing to aridity and desertification in northern Nigeria, it is increasing the frequency of flooding and erosion (gully, sheet and coastal) in the southern parts, especially in the coastal and rainforest zones.¹¹ The Nigerian Environmental Study/Action Team reported that sea-level rise and repeated ocean surges worsen coastal erosion, which is already a menace in that zone.¹² The associated inundation exacerbates the intrusion of seawater into fresh water sources and ecosystems, destroying such stabilising systems as mangroves and causing crop loss.

In the savannah and Sahel, the impacts of climate change include increased variability; decreased rainfall; increased temperature and evaporation; frequent drought spells, leading to water shortage; delayed and more variable onsets, leading to changes in planting dates of annual crops; increasing desertification and subsequently, inadequate grazing resources; increased movement of pastoralists to the humid south for fodder and



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water; and in some regions, increasing rural-urban migration.

These diverse climate-related impacts and potential adaptation measures have to be seen in the context of Nigeria's agro-ecological, production and socio cultural diversities, and in the context of rainfall and temperature trends and periodicities. Coping and adaptation measures to reduce vulnerability and strengthen the resilience of agricultural production thus range from actions at the farm household, community, state and national levels. The framing policy environment also determines how effective such measures are.

Government Policies and Programmes

In the past, a number of policies and programmes aiming to increase agricultural production, ensure food security and reduce poverty achieved less than the expected successes. These include recent programmes like the national food security programme and the National Fadama Development Programme (NFDP) of 1993.¹³ Some of these programmes, such as the NFDP, were established as responses to increasing exposure to droughts and associated losses in food production, and were meant to increase cropping in low-lying plains, using small irrigation measures. Reasons for their limited success include lack of in-depth studies and realistic pilot surveys on which the projects were based.

Many policies adequately address individual topics; however, limited human and institutional capacity, lack of coordination and low policy coherence remain persistent within and across both production sectors and Nigeria's three tiers of government (federal, state and local).¹⁴ For instance, in the fertiliser sector, Sanyal and Babu report a misfit of implementation with the agronomic requirements for the various agro-ecological zones, weak legal and regulatory frameworks, non-inclusion of major actors in the policymaking process, and incapacity of the macroeconomic environment to stabilise farm gate prices of fertiliser to a level that promotes wider adoption and increased use.¹⁵ With regard to food security, inadequate provision of physical and institutional infrastructure, together with a low use of the knowledge base, resulted in poor targeting, poor resource allocation, and inadequate responses to food insecurity.¹⁶ To foster an enabling environment, improve efficiency and avoid duplication and fragmentation of already

limited resources, the above limitations need to be addressed.

Nigeria has only recently begun to develop a policy framework to address climate change adaptation. A draft National Adaptation Strategy and Plan of Action (NASPA) has been developed by the Building Nigeria's Response to Climate Change (BNRCC) of the Nigerian Environmental Study Action Team (NEST), and submitted to the Nigerian Ministry of Environment.¹⁷ There is as yet no adaptation plan at the federal, state and local government levels, while low public awareness of climate change and its associated risks persist.

There is, however, a Federal Government of Nigeria (FGN) agriculture policy, which aims to '(i) attain food security, (ii) increase production and productivity, (iii) generate employment and income, and (iv) expand exports and reduce food imports thereby freeing resources for critical infrastructure development and delivery of social services'.¹⁸ The

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FGN, through the Federal Ministry of Agriculture and Rural Development (FMARD), also follows the Comprehensive Africa Agriculture Development Program (CAADP) principles through a five-point agenda in its National Agriculture Investment Plan (NAIP): (1) develop an agricultural policy and regulatory system; (2) establish an agriculture commodity exchange market; (3) raise agricultural income through supporting a sustainable environment; (4) maximise agricultural revenue in key enterprises; and (5) improve water, aquaculture and environmental resource management. Under agenda (5), the FGN plans a carbon credit project through afforestation and reforestation, but provides no details on how it aims to achieve this.

In addition, the government has set a higher target of 10 percent annual growth rate for the agricultural sector, compared with the 6 percent



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annual rate agreed by CAADP in Maputo in 2003,¹⁹ and aims to achieve this through fostering an enabling environment – for example, through the above-mentioned five-point agenda. However, CAADP cautions that for Nigeria to increase productivity, it needs to increase efforts to adopt improved crop varieties, reduce post-harvest losses, expand irrigated areas and increase funding to agriculture.²⁰

CAADP also finds a lack of modalities for including and engaging the private sector and civil society; systematic linking of planning and decision-making between the federal and state levels; the use of evidence-based analysis to rationalise investments; and investments in strategic analysis and knowledge support systems. It thus recommends integrating the food security programmes into one framework to improve horizontal and vertical coordination, and to clarify the role and level of private sector engagement.²¹ However, the country has yet to address these challenges.

Agriculture is on the concurrent list of the Nigerian Constitution. This means that there are roles for all three levels of government: federal, state and local. These roles often overlap, while each state or local council is at liberty to set priorities, depending on local characteristics. However, the local government is closest to the communities and farmers. The roles of local governments in enhancing agricultural production, as contained in the New Policy Thrust of Agriculture, are: provision of effective agricultural extension services; rural infrastructures provision; management of irrigation areas; mobilisation of farmers for accelerated agricultural and rural development through cooperative organisations, local institutions and communities; provision of land for new entrants into farming, in accordance with the Land Use Act; and coordination of data collection at the primary levels.²²

The New Policy Thrust of Agriculture also assigns the private sector some roles. These include investment in all aspects of crop production; crop produce storage, processing and marketing; crop input supply and distribution; production of commercial seeds and seedlings under government certification and quality control; agricultural mechanisation; provision of enterprise-specific rural infrastructure; and support for research in crop production.²³

While the strength of the federal government lies in developing enabling policy frameworks for the

state and local governments to follow, its limitation lies in the fact that some relevant actors – such as the smallholders, who are the major producers, and the private sector – are not involved from the outset. Very few platforms exist to involve them in the policy process, even though they are expected to implement the goals set in the policies. On their part, the state governments could improve collaboration with their neighbouring states: for example, in coordinating agricultural development programmes.

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The FGN plans to expand irrigation to increase food security, and to implement adaptations to climate change. However, it is necessary that past irrigation programmes are reviewed, in order to ensure that successes are built upon, climate change impacts accounted for and mal-adaptations avoided.²⁴ The whole agricultural value chain, from production to marketing, also needs to be accounted for, as post-harvest losses and inadequate market access still deprive farmers and vulnerable populations of the full benefits of increased productivity.

Pathways for Climate Change Adaptation in the Agricultural Sector

Considering the various challenges (climatic as well as non-climatic), differential impacts, and the uncertainties in both climate projections and socio-economic driving factors, it is advisable that Nigeria focuses on increasing the resilience of agricultural production to climate change. Related measures will include building buffers and buffer capacities that enable adaptation, and improving self-organisation and the capacity for learning.

Ecological buffer capacity relates to growing crops that are tolerant to the prevailing climatic

conditions, adopting better agronomic practices that increase soil moisture holding capacity (e.g., conservation tillage), and soil erosion protection measures, such as terraces and bunds. Enhancing farmers' *socio-economic buffer capacities* would entail increasing their livelihood assets in ways that provide them with necessary human, financial, social, physical and natural capitals by improving their access to markets, information and new technology.

Improving self-organisation refers to how well farmers are organised by themselves to be able to address the problems they encounter with little external help.

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The *capacity for learning* refers to a farmer's management approach and openness for learning. As farmers are constantly adjusting their activities and learning from other farmers and their environment, indigenous knowledge reflects this adaptive learning; the question, then, is how farmers are enabled to learn from their experiences. Government thus needs to understand and strengthen indigenous knowledge systems.

Such a resilience approach needs to be region-specific, and adapted to socio-ecological characteristics. As adaptation is local, but with framing conditions defined at state, national and international levels, both a bottom-up participatory approach and a top-down guiding framework should be adopted. A major question for governments and support organisations would be in what ways, and how much, their policies and actions improve the farmer's buffer capacity, self-organisation and capacity for learning.²⁵

As part of the resilience approach, the following four core measures are crucial for successful adaptation: awareness; enabling policy and working conditions; understanding past and future climatic trends; and integrating local knowledge.

Although inadequate human capital is a major

issue, the constraining structural framework is even more debilitating, which demotivates the few skilled Nigerian professionals. Hence, improving working conditions (e.g., fostering an enabling policy framework and providing tools for Nigerian professionals to work with) and reforming structures (e.g., improving coordination) are major prerequisites for effective adaptation actions.

We need a better understanding of the changes that the Nigerian climate has undergone and is likely to undergo in the future. We need information on the likely duration and dynamics of certain trends and periodicities in climate (e.g., the drought and non-drought decades in the Sahel) that have prevailed over time and in certain areas, and to know whether they are likely to occur in future. Such insights will allow for better tailoring of adaptation measures and for ensuring flexibility in adaptation measures.

Farmers are continually adapting their production to variable social-ecological conditions, and they have valuable local knowledge that can provide useful insights to professionals. Considering the diverse agro-ecological zones, documenting and strengthening indigenous knowledge can provide stores of adaptation knowledge.

The following recommendations have to be understood as add-ons to the above points and to the need, discussed earlier, to improve policy coherence and coordination.

- **Develop improved crop varieties.** The federal and state governments should increase their support (funding, research infrastructure development) for plant breeders in developing high yielding and early maturing crop varieties that are not genetically modified; and for research in developing water, heat/drought tolerant, and disease resistant crop varieties. Farmer perspectives should be integrated in such schemes, and farmers supported to access the improved seeds. Government, in partnership with the private sector and research, should establish seed banks to maintain biological diversity.
- **Encouraging agro-forestry.** Agro-forestry is an age-old practice in the humid and sub-humid zones. This practice can be upscaled to other zones by integrating an agro-forestry component into state agricultural development programmes where they are currently non-existent. This is also beneficial for livestock production, as trees can provide fodder.

- **Increase support for reforestation and afforestation programmes.** Various local and state governments should establish woodlands with indigenous, fast-maturing plant species that yield domestic fuel wood for communities. Tree planting campaigns should continue, and a review of past programmes should be conducted to identify the underlying factors for success or failure and for effective follow-up.
 - **Promote a balanced mix of organic manure and inorganic fertilisers.** While organic fertilisers increase productivity in a more environmental friendly manner, Nigeria is not in a situation to relinquish the use of inorganic fertilisers. Its fertiliser usage of 7kg per hectare is one of the lowest in Africa.²⁶ Thus, government should establish an organic agriculture policy, and provide extension agents and farmers with the relevant knowledge of how to increase efficiency in using both fertiliser types.
 - **Improve Early Warning Systems (EWS)** for seasonal weather forecasts. Improving EWS, and addressing their challenges to disseminating weather forecasts to farmers on time, will increase farmer adaptiveness – e.g., through changing planting dates to adapt to changing conditions.
 - **Greater support for insurance.** Government should increase support for the Nigerian Agricultural Insurance Scheme, and incentivise farmers to register with the scheme. This will help insure farmers against crop failure due to flood, erosion and drought, and against livestock deaths due to flood, diseases and drought.
 - **Strengthen integrated pest management systems.** Pests can be controlled in different ways (biological, chemical, mechanical, cultural). Careful combinations of methods, adapted to local conditions, are more effective than are blanket solutions.
 - **Improve post-harvest management.** Post-harvest loss constitutes a considerable part of crop losses. The government could incentivise the private sector (e.g., through tax cuts) to invest in local food packaging and processing, and to address storage challenges at farm levels.
 - **Improve rural transportation.** Government should rehabilitate and construct new roads in the rural coastal and rainforest zones of Nigeria, where crop production is mainly done. This will help to improve farmers' access to markets.
 - **Improve agricultural extension services.** Improving and increasing the extension staff of government and NGOs and exploring radio-based extension services will be paramount in climate change adaptation.
 - **Improve agronomic practices to suit the agro-ecological zone.** This includes various conservation technologies: zero tillage; soil erosion control; rainwater harvesting; and various measures to reduce run-off and allow water to infiltrate and trap sediments during floods. Measures to reduce evaporation, such as planting cover crops, also control erosion and increase soil fertility. In some areas, drainage might be more important than irrigation. Increasing support for shore land protection and filling will check the landslides observed in coastal and rainforest zones.
 - **Livestock keeping.** Keeping livestock in confinement (zero-grazing) ranges instead of free ranges will help farmers increase control over livestock grazing. Government, the private sector and NGOs can help livestock farmers adapt to climate change by providing soft loans for transiting to feedlot livestock production.
 - **Weigh the benefits of productivity and adaptability in introducing livestock hybrids.** Government should increase support for livestock breeders in improving the disease resistance of the local Zebu breeds, which are well adapted to the Nigerian climate. Proven traditional cures for livestock diseases should be integrated into formal veterinary medicine after appropriate validations.
 - **Regular vaccination of livestock and cross-border diseases surveillance.** This will help reduce infections, especially those contracted from migrating animals.
 - **Provision of potable water for livestock.** Construction of dams, boreholes and wells is recommended to cater for livestock farmers' water needs during dry spells.
- On-farm diversification (e.g., integrating crop and livestock farming) is one way to reduce climate change impacts. However, this might lead to fragmentation of farmers' resources. Diversification into non-farm activities therefore needs to be carefully weighed in relation to the socio-ecological conditions.
- Finally, ownership of adaptation measures by stakeholders at the various levels – national, state

and local – is crucial for effectively increasing food security and adapting to climate change. These can be attained within the emerging national climate change policy and climate change adaptation strategy and plan of action. In addition Nigeria is on the verge of setting up a national climate change commission under the presidency. This commission should give great impetus to climate change adaptation and mitigation efforts.

Although these recommendations are specific, a broader framework and guiding principle for improving food security and agricultural production would include a clarification of roles and responsibilities between the three tiers of

government, even though this may seem obvious. It should be the role of the state governments to adapt the federal policies to their different areas and implement the relevant projects. Such a framework should make the states accountable to the federal government about the actions the states have undertaken to improve food security and increase agricultural production in their various areas. This will also enable comparison across states, which can foster their motivation. The federal government should concentrate on improving policy frameworks based on research evidence and an inclusive approach whereby relevant actors both outside and within the government are actively involved.

Endnotes

- 1 We appreciate the Nigerian Environmental Study Action team, Ibadan, Nigeria, which – in partnership with Marbek and CUSO-VSO of Canada – has been implementing a CIDA-funded project, 'Building Nigeria's Response to Climate Change', since 2007. Most of the lessons presented here have come from this project. We also acknowledge the research and pilot project partners of the BNRCC. Chinwe Ifejika Speranza acknowledges support from the German Federal Ministry for Economic Cooperation and Development (BMZ) under its flagship project, 'Climate Change and Development'; and the Swiss National Centre of Competence in Research North-South Programme's 'Research Partnerships for Mitigating Syndromes of Global Change'.
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